CLAIMS

What is claimed is:

1. A wearable display system having a display panel to output a signal, comprising:

a waveguide to guide a propagation of the signal output from the display panel;

a plurality of gratings to diffract the signal propagating through the waveguide ; and

a magnifying lens to magnify the signal diffracted by one of the plurality of gratings.

2. The wearable display system according to claim 1, wherein the plurality of gratings comprises:

a first grating to diffract the signal output from the display panel so that the signal propagates through the waveguide; and

a second grating to diffract the signal propagating through the waveguide and diffracted by the first grating.

3. The wearable display system according to claim 1, wherein the plurality of gratings comprises:

a first grating to reflect the signal output from the display panel and incident on the first grating at a predetermined incidence angle, at a predetermined reflection angle; and

a second grating to reflect the signal propagating through the waveguide and incident upon the second grating at the predetermined reflection angle at the first grating, at the predetermined incidence angle at the first grating.

4. The wearable display system according to claim 1, wherein the plurality of gratings comprises:

a first grating to transmit the signal output from the display panel and incident on the first grating at a predetermined incidence angle, at a predetermined transmission angle to propagate the output signal through the waveguide; and

a second grating to transmit the signal propagating through the waveguide and incident upon the second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

5. The wearable display system according to claim 1, wherein the plurality of gratings comprises:

a first grating to reflect the signal output from the display panel and incident on the first grating at a predetermined incidence angle, at a predetermined reflection angle; and

a second grating to transmit the signal propagating through the waveguide and incident upon the second grating at the predetermined reflection angle at the first grating, at the predetermined incidence angle at the first grating.

6. The wearable display system according to claim 1, wherein the plurality of gratings comprises:

a first grating to transmit the signal output from the display panel and incident upon the first grating at a predetermined incidence angle, at a predetermined transmission angle; and

a second grating to reflect the signal propagating through the waveguide and incident upon the second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

7. The wearable display system according to claim 1, further comprising a shutter to alternately block a plurality of the signals output by the display panel in the waveguide, to produce a three-dimensional image.

8. The wearable display system according to claim 1, wherein the magnifying lens is movable along a predetermined length of the waveguide.

9. A wearable display system having a binocular structure, comprising:

a waveguide through which a signal propagates;

a display panel at a center of the waveguide, the display panel to output the signal;

a first grating to diffract the signal output from the display panel and incident upon the first grating at a predetermined incidence angle, in opposite directions of the waveguide at a predetermined diffraction angle;

a plurality of second gratings to diffract the signal diffracted by the first grating and incident upon the second gratings at the predetermined diffraction angle at the first grating, at the predetermined incidence angle at the first grating; and

a plurality of magnifying lenses to magnify the signal diffracted by corresponding ones of the second gratings.

10. The wearable display system according to claim 9, wherein the first grating is adjacent to the display panel and is a transmission type display panel to transmit the signal output from the display panel and incident upon the first grating at the predetermined incidence angle, in the opposite directions within the waveguide at a predetermined transmission angle.

11. The wearable display system according to claim 10, wherein each of the second gratings is a reflection type grating to reflect the signal propagating through the waveguide and incident upon the second gratings at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

12. The wearable display system according to claim 10, wherein each of the second gratings is a transmission type grating to transmit the signal propagating through the waveguide and incident upon the second gratings at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

13. The wearable display system according to claim 10, wherein the plurality of second gratings comprises:

one of the second gratings of a transmission type to transmit the signal propagating through the waveguide and incident upon the transmission type second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating, and

another one of the second gratings of a reflection type to reflect the signal propagating through the waveguide and incident upon the reflection type grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

14. The wearable display system according to claim 9, wherein the first grating is positioned opposite to the display panel in the waveguide and is a reflection type grating to reflect the signal output from the display panel and incident upon the first grating at the

predetermined incidence angle, at a predetermined reflection angle in the opposite directions of the waveguide.

15. The wearable display system according to claim 14, wherein each of the second gratings is a transmission type grating to transmit the signal propagating through the waveguide and incident upon the second gratings at the predetermined reflection angle at the first grating, at the predetermined incidence angle at the first grating.

16. The wearable display system according to claim 14, wherein each of the second gratings is a reflection type grating to reflect the signal propagating through the waveguide and incident upon the second gratings at the predetermined reflection angle at the first grating, at the predetermined incidence angle at the first grating.

17. The wearable display system according to claim 14, wherein the plurality of second gratings comprises:

one of the second gratings of a transmission type to transmit the signal propagating through the waveguide and incident upon the transmission type second grating at the predetermined diffraction angle at the first grating, at the predetermined incidence angle at the first grating, and

another one of the second gratings of a reflection type to reflect the signal propagating through the waveguide and incident upon the reflection type second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

18. The wearable display system according to claim 9, further comprising a shutter to alternately block a plurality of the signals output by the display panel within the waveguide, to produce a three-dimensional image.

19. The wearable display system according to claim 9, wherein each of the magnifying lenses is movable along a predetermined length of the waveguide.

20. A wearable display system having a binocular structure, comprising:

a waveguide through which signals propagate;

two display panels respectively placed on opposite sides of the waveguide, each of the display panels to output one of the signals;

two first gratings to diffract the signals output from the display panels and incident upon the first gratings at a predetermined incidence angle, at a predetermined diffraction angle in opposite directions of the waveguide;

second gratings to diffract the signals propagating through the waveguide and incident upon the second gratings at the predetermined diffraction angle at the first gratings, at the predetermined incidence angle at the first gratings; and

magnifying lenses to magnify the signals diffracted by corresponding ones of the second gratings.

21. The wearable display system according to claim 20, wherein each of the first gratings is located adjacent to a respective one of the display panels, and is a transmission type grating to transmit the signal output from the respective one of the display panels and incident

upon the first gratings at the predetermined incidence angle, at a predetermined transmission angle in one of the opposite directions of the waveguide.

22. The wearable display system according to claim 21, wherein each of the second gratings is a reflection type grating to reflect the signals propagating through the waveguide and incident upon the second gratings at the predetermined transmission angle at the first gratings, at the predetermined incidence angle at the first gratings.

23. The wearable display system according to claim 21, wherein each of the second gratings is a transmission type grating to transmit the signals propagating through the waveguide and incident upon the second gratings at the predetermined transmission angle at the first gratings, at the predetermined incidence angle at the first gratings.

24. The wearable display system according to claim 21, wherein the two second gratings comprise:

one of the second gratings of a transmission type to transmit the signals propagating through the waveguide and incident upon the transmission type second grating at the predetermined transmission angle at the first gratings, at the predetermined incidence angle at the first gratings, and

another one of the second gratings is a reflection type grating to reflect the signals propagating through the waveguide and incident upon the reflection type second grating at the predetermined transmission angle at the first gratings, at the predetermined incidence angle at the first gratings.

25. The wearable display system according to claim 20, wherein each of the first gratings is positioned opposite to a respective one of the display panels in the waveguide and is a reflection type grating to reflect the signal output from the respective display panel and incident upon the first gratings at the predetermined incidence angle, at a predetermined reflection angle in one of the opposite directions of the waveguide.

26. The wearable display system according to claim 25, wherein each of the second gratings is a reflection type grating to reflect the signals propagating through the waveguide and incident upon the second gratings at the predetermined reflection angle at the first gratings, at the predetermined incidence angle at the first gratings.

27. The wearable display system according to claim 25, wherein each of the second gratings is a transmission type grating to transmit the signals propagating through the waveguide and incident upon the second gratings at the predetermined reflection angle at the first gratings, at the predetermined incidence angle at the first gratings.

28. The wearable display system according to claim 25, wherein the two second gratings comprise:

one of the second gratings of a transmission type grating to transmit the signals propagating through the waveguide and incident upon the transmission type second grating at the predetermined reflection angle at the first gratings, at the predetermined incidence angle at the first gratings, and

another of the second gratings is a reflection type grating to reflect the signals propagating through the waveguide and incident upon the reflection type second grating at the predetermined reflection angle at the first gratings, at the predetermined incidence angle at the first .

29. The wearable display system according to claim 20, wherein the two first gratings comprise:

one of the first gratings located adjacent to a first one of the display panels and is a transmission type grating to transmit a one of the signals output from said first one of the display panels and incident upon the transmission type first grating at the predetermined incidence angle, at a predetermined transmission angle, and

another of the first gratings is opposite to a second one of the display panels and is a reflection type grating to reflect a one of the signals output from said second one of the display panels and incident upon the reflection type first grating at the predetermined incidence angle, at a predetermined reflection angle.

30. The wearable display system according to claim 29, wherein each of the second gratings is a transmission type grating.

31. The wearable display system according to claim 29, wherein each of the second gratings is a reflection type grating.

32. The wearable display system according to claim 29, wherein one of the second gratings is a transmission type grating, and another one of the second gratings is a reflection type grating.

33. The wearable display system according to claim 20, further comprising a shutter to alternately block the signals in the waveguide to produce a three-dimensional image.

34. The wearable display system according to claim 20, wherein each of the magnifying lenses is movable along a predetermined length of the waveguide.

35. A wearable display system having a monocular structure, comprising:

a waveguide through which a signal propagates;

a display panel placed on the waveguide, the display panel to output the signal;

a first grating to diffract the signal output from the display panel and incident upon the first grating at a predetermined incidence angle, at a predetermined diffraction angle in either a first direction, or a second direction opposite the first direction, of the waveguide;

a second grating to diffract the signal propagating through the waveguide and incident upon the second grating at the predetermined diffraction angle at the first grating, at the predetermined incidence angle at the first grating; and

a magnifying lens to magnify the signal diffracted by the second grating.

36. The wearable display system according to claim 35, wherein the second grating is placed on a same surface of the waveguide as the first grating.

37. The wearable display system according to claim 35, wherein the second grating is placed on an opposite side of the waveguide as the first grating.

38. The wearable display system according to claim 35, wherein:

the first grating is located adjacent to the display panel, and the first grating is a transmission type grating to transmit the signal output from the display panel and incident upon the first grating at the predetermined incidence angle, either in the first or second direction within the waveguide at a predetermined transmission angle.

39. The wearable display system according to claim 38, wherein the second grating is a reflection type grating to reflect the signal propagating through the waveguide and incident upon the second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

40. The wearable display system according to claim 38, wherein the second grating is a transmission type grating to transmit the signal propagating through the waveguide and incident upon the second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

41. The wearable display system according to claim 35, wherein the first grating is positioned opposite to the display panel in the waveguide and is a reflection type grating to reflect the signal output from the display panel and incident upon the first grating at the

predetermined incidence angle, at the predetermined reflection angle in either the first or second direction within the waveguide.

42. The wearable display system according to claim 41, wherein the second grating is a transmission type grating to transmit the signal propagating through the waveguide and incident upon the second grating at the predetermined reflection angle at the first grating, at the predetermined incidence angle at the first grating.

43. The wearable display system according to claim 41, wherein the second grating is a reflection type grating to reflect the signal propagating through the waveguide and incident upon the second grating at the predetermined reflection angle at the first grating, at the predetermined incidence angle at the first grating.

44. A wearable display system having a binocular structure, comprising:

a waveguide through which signals propagate;

two display panels respectively placed on both ends of the waveguide, the display panels to output the signals;

two first gratings located adjacent to the display panels, to respectively transmit the signals output from the display panels and incident on the first gratings at a predetermined incidence angle, into the waveguide at a predetermined transmission angle;

second gratings oriented perpendicular to the first gratings of the waveguide to diffract the signals propagating through the waveguide and incident upon the second gratings at the predetermined transmission angle at the first gratings, at the predetermined incidence angle at the first gratings; and

magnifying lenses to magnify the signals diffracted by corresponding ones of the second gratings.

45. The wearable display system according to claim 44, wherein each of the second gratings is a reflection type grating to reflect the incident signals at the predetermined incidence angle at the first gratings.

46. The wearable display system according to claim 44, wherein each of the second gratings is a transmission type grating to reflect the incident signals at the incidence angle at the first gratings.

47. The wearable display system according to claim 44, wherein the display panels display the signals with a time difference with respect to each other to produce a three-dimensional image.

48. The wearable display system according to claim 44, further comprising a shutter to alternately block ones of the signals within the waveguide to produce a three-dimensional image.

49. The wearable display system according to claim 44, wherein the magnifying lenses are movable along a predetermined length of the waveguide.

50. A wearable display system having a monocular structure, comprising:

a waveguide through which a signal propagates;

a display panel placed either on a first end, or a second end opposite the first end, of the waveguide, the display panel to output the signal;

a first grating to diffract the signal output from the display panel and incident upon the first grating at a predetermined incidence angle into the waveguide at a predetermined diffraction angle;

a second grating oriented perpendicular to the first grating in the waveguide, the second grating to diffract the signal propagating through the waveguide and incident upon the second grating at the predetermined diffraction angle at the first grating, at the predetermined incidence angle at the first grating; and

a magnifying lens to magnify the signal diffracted by the second grating.

51. The wearable display system according to claim 50, wherein the first grating is positioned opposite to the display panel in the waveguide and is a reflection type grating to reflect the signal output from the display panel and incident upon the first grating at the predetermined incidence angle, at a predetermined reflection angle within the waveguide.

52. The wearable display system according to claim 51, wherein the second grating is a transmission type grating to transmit the signal propagating through the waveguide and incident upon the second grating at the predetermined reflection angle at the first grating, at the predetermined incidence angle at the first grating.

53. The wearable display system according to claim 50, wherein the first grating is adjacent to the display panel, and the first grating is a transmission type grating to transmit the signal output from the display panel and incident upon the first grating at the predetermined incidence angle, within the waveguide at a predetermined transmission angle.

54. The wearable display system according to claim 53, wherein the second grating is a transmission type grating to transmit the signal propagating through the waveguide and incident upon the second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

55. The wearable display system according to claim 53, wherein the second grating is a reflection type grating to reflect the signal propagating through the waveguide and incident upon the second grating at the predetermined transmission angle at the first grating, at the predetermined incidence angle at the first grating.

56. A wearable display system having a display panel to output a signal processed in a predetermined way, comprising:

a waveguide to guide a propagation of the signal output from the display panel;

a plurality of gratings to diffract the signal propagating through the waveguide; and

a magnifying lens to magnify the signal diffracted by the plurality of gratings,

wherein the signal propagates to left and right eyes of a user with a time difference, thereby producing a three-dimensional image.

57. A wearable display system having a display panel to output a signal, comprising:

a waveguide to guide a propagation of the signal output from the display panel;

a first grating to diffract the signal propagating through the waveguide;

a second grating to diffract the signal propagating through the waveguide and incident upon the second grating, toward eyes of a user; and

a magnifying lens to magnify the signal diffracted by the second grating.